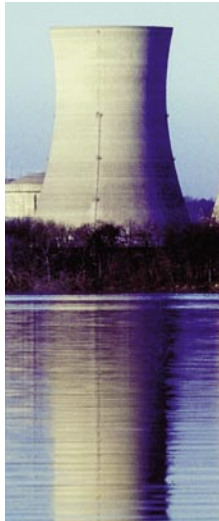
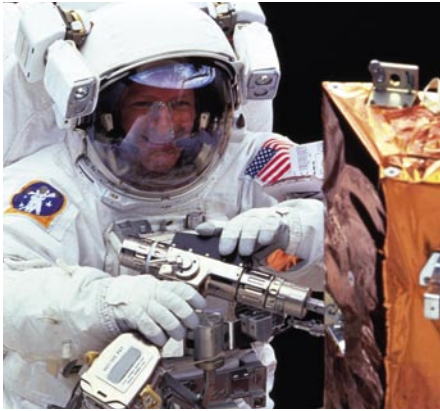




# A Computer-Controlled Power Tool

... enhanced speed and reliability for automated data file transfers



NASA Goddard Space Flight Center invites companies to license this new computer-controlled power tool that can be used to turn a drill bit, wrench socket, screwdriver, or other tool bit clockwise or counterclockwise at a precisely controlled speed, torque, or number of turns. Goddard's new tool has been specifically deployed on the Hubble Space Telescope as well as on the Space Shuttle and aboard the International Space Station. Featuring remote operation capabilities, radiation tolerance, and the ability to operate at extreme temperatures, the technology may also be advantageous in any hazardous or inconvenient environment in which the tool might be held by a robotic arm and directed by a remote human operator.

## Benefits

- **Precise control:** Controls speed and/or torque with precision
- **Remote control capability:** Can easily be controlled remotely by an external computer
- **Cost-efficient packaging:** Does not require spaceflight-qualified materials when used in earth-based applications, greatly saving per-unit tool manufacturing costs
- **Performance data logging:** Is capable of reporting and storing more than 200 performance records containing applied torque, angle and time information from which applied energy and successful torquing can be derived
- **Space-flight qualification:** Can operate in the temperature range of  $-55$  to  $+125$  °C and is radiation tolerant
- **Energy efficiency:** Powered by either a battery or a power-supply circuit, and features a power-conservation mode
- **Real-time monitoring and analysis:** Transfers information between the tool's processor and an external computer to analyze data or to modify operational parameters

## Applications

- Manufacturing
  - Computer assembly
  - Consumer goods assembly
  - Automotive assembly
- Medical/Surgical
  - Orthopedic brace adjustment
  - Artificial limb maintenance
- Spacecraft maintenance and repair
  - Satellites
  - Space telescopes
  - Space stations
  - Shuttles
- Remote instrument or tool manipulation
  - Nuclear facilities
  - Vacuum, thermal, and high-pressure chambers
  - Other harsh environments (e.g., biohazards, chemical/explosive areas)

## Technology Details

Goddard's Computer-Controlled Power Tool technology provides highly precise control of speed and torque for use with a variety of applications. The technology provides a programmed-controlled processor within the housing of the tool, which communicates with an external (remote) computer for the purposes of monitoring and analyzing tool performance.

### Operation

The tool is easily powered on or off by pressing or releasing the trigger on the hand grip. A display communicates the current torque and speed performance parameter values, and light-emitting diode (LED) indicators also alert the operator to various operation conditions. Selection controls enable the operator to change these values and to select many parameters such as speed, torque, number of revolutions, and rotation direction.

### Monitoring and analysis

The processor enables monitoring of the tool's operating parameters and power supply and keeps a performance history of the tool's operation, which it communicates to an external processor for analysis. Performance history is stored in a nonvolatile memory connected to the processor. The processor communicates performance data to a remote computer, enabling an operator to analyze the data stored in the tool or modify the operational parameters remotely, using the external computer rather than the selection controls located on the tool itself.

### Why it is better

Goddard's Computer-Controlled Power Tool technology superficially resembles several other commercially available hand-held tools, but it uniquely offers the following advantageous features:

- The ability to monitor and analyze torque and temperature values in real time

- Speed-measurement capabilities using shaft-rotation, pulse-counting, and timing circuitry
- Controls for operation mode, rotation direction, and desired torque and speed values
- An enclosed processor that generates its own timing signals and monitors operations
- A drive circuit through which the processor controls the motor's electric current
- Displays that communicate current performance and power parameters
- Remote operation via communication between the tool's processor and an external computer

## Patents

NASA Goddard Space Flight Center has patented this technology (U.S. Patent No. 5,903,462).

## Licensing and Partnering Opportunities

This technology is part of NASA's Innovative Partnerships Program, which seeks to transfer technology into and out of NASA to benefit the space program and U.S. industry. NASA invites companies to consider licensing the Method and Apparatus for Controlling a Tool (Computer-Controlled Power Tool) technology (GSC-13879-1) for commercial applications.

## For More Information

If you are interested in more information or want to pursue transfer of this technology (GSC-13879-1), please contact:

**Office of Technology Transfer**  
**NASA Goddard Space Flight Center**  
**ComputerPowerTool@gsfc.nasa.gov**

More information about working with NASA Goddard's Office of Technology Transfer is available online:

<http://techtransfer.gsfc.nasa.gov>